WHAT IS CLAIMED IS:

1.   A method of determining a package's transmission of a gas of interest comprising the steps of:

     a. obtaining data representing the package's total transmission of a test gas, said test gas being different than said gas of interest;

     b. determining the package's test gas leakage and test gas permeation components of said total test gas transmission; and

     c. determining the package's transmission of the gas of interest based upon its test gas transmission.

2.   The method of claim 1, wherein step b includes determining one of said leakage and permeation components by determining the other of said leakage and permeation components and subtracting said other of said components from the package's total test gas transmission.

3.   The method of claim 1, wherein step b includes determining the package's test gas permeation based upon the areas of the materials comprising the package through which gas can permeate, and upon the permeability of said materials to the test gas.

4.   The method of claim 1, wherein step c includes determining the package's gas-of-interest permeation based upon its test gas permeation.

5.   The method of claim 4, wherein the determination of the package's gas-of-interest permeation includes correlating the gas-of-interest permeability of the package's materials to their test gas permeability.

6.   The method of claim 4, wherein the determination of the package's gas-of-interest permeation includes determining the area of each material comprising the package through which gas can permeate, and multiplying each said area by the ratio of the gas-of-interest permeability and the test gas permeability for the material comprising said area.

7.   The method of claim 1, wherein step c includes determining the package's gas-of-interest leakage based upon its test gas leakage.

8.   The method of claim 7, wherein the package's gas-of-interest leakage is determined in accordance with the ratio of the square roots of the molecular weights of the gas of interest and the test gas, or in accordance with the square root of the ratio of the molecular

- 16 -

weights of the gas of interest and the test gas.

9.   The method of claim 1, wherein step c includes determining the package's gas-of-interest leakage and its gas-of-interest permeation.

10.   The method of claim 9, wherein step c includes determining the package's total gas-of-interest transmission by adding its gas-of-interest leakage and its gas-of-interest permeation.

11.   The method of claim 1, wherein said test gas is helium.

12.   The method of claim 1, wherein said gas of interest is oxygen, water vapor, or carbon dioxide.

13.   Apparatus for determining a package's transmission of a gas of interest, comprising stored data and a processor operating on said stored data in accordance with software, wherein said stored data includes test gas permeation data representing the permeation of a test gas through the package and permeation correlation data correlating the permeation of a gas of interest through the package with the permeation of the test gas through the package, and said processor operates on said test gas permeation data and said permeation correlation data to determine the permeation of the gas of interest through the package.

14.   The apparatus of claim 13, wherein said stored data further includes test gas total transmission data representing the package's total transmission of the test gas, and said processor operates on said test gas total transmission data and said test gas permeation data to determine the leakage of the test gas through the package.

15.   The apparatus of claim 14, wherein said stored data further includes leakage correlation data correlating the leakage of the gas of interest through the package with the leakage of the test gas through the package, and said processor operates on said test gas leakage data and said leakage correlation data to determine the leakage of the gas of interest through the package.

16.   The apparatus of claim 13, wherein said stored data further includes test gas permeability data representing the permeability to the test gas of the materials comprising the package and package structure data representing the areas of the materials through which the test gas can permeate, and said processor operates on said test gas permeability data and said package structure data to determine said test gas permeation data.

17.   The apparatus of claim 13, wherein said data pertaining to a test gas pertains to helium.

18.   The apparatus of claim 13, wherein said data pertaining to a gas of interest includes data pertaining to oxygen, water vapor, or carbon dioxide.

19.   The apparatus of claim 13, wherein said stored data includes data correlating the permeation of a plurality of gases selectable as a gas of interest with the permeation of one or more gases selectable as a test gas.

20.   A method of determining the effect of a gas of interest on a product within a package comprising the steps of:

        a. obtaining data representing the package's total transmission of a test gas, said test gas being different than said gas of interest;

        b. determining the package's transmission of the gas of interest based upon its test gas transmission;

        c. obtaining storage condition data representing the amount of the gas of interest in the atmosphere surrounding the package during storage; and

        d. obtaining data representing the sensitivity of the product to the gas of interest and determining the shelf life of the packaged product based upon the package's gas-of-interest transmission, the storage condition data, and the product sensitivity data, or obtaining data representing the shelf life of the packaged product and determining the sensitivity of the product to the gas of interest based upon the package's gas-of-interest transmission, the storage condition data, and the shelf life data.

21.   A method of determining a packaging material specimen's permeation of a gas of interest comprising the steps of:

        a. obtaining data representing the specimen's permeation of a test gas, said test gas being different than said gas of interest;

        b. obtaining correlated test gas permeation data and gas-of-interest permeation data pertaining to the packaging material of which the specimen is made; and

c. determining the specimen's gas-of-interest permeation based upon its test gas permeation data and said correlated data.

22.　The method of claim 21, wherein the specimen's gas-of-interest permeation P_X is determined as $P_X = P_T (p_X/p_T)$ where p_T is the packaging material test gas permeability, p_X is the packaging material gas-of-interest permeability, and P_T is the specimen's test gas permeation.

23.　The method of claim 21, wherein said test gas is helium.

24.　The method of claim 21, wherein said gas of interest is oxygen, water vapor, or carbon dioxide.

25.　Apparatus for determining a packaging material specimen's transmission of a gas of interest, comprising stored data and a processor operating on said stored data in accordance with software, wherein said stored data includes test gas permeation data representing the permeation of a test gas through the specimen and permeation correlation data correlating the permeation of a gas of interest through the packaging material with the permeation of the test gas through the packaging material, and said processor operates on said test gas permeation data and said permeation correlation data to determine the permeation of the gas of interest through the specimen.

26.　The apparatus of claim 25, wherein said data pertaining to a test gas pertains to helium.

27.　The apparatus of claim 25, wherein said data pertaining to a gas of interest includes data pertaining to oxygen, water vapor, or carbon dioxide.

28.　The apparatus of claim 25, wherein said stored data includes data correlating the permeation of a plurality of gases selectable as a gas of interest with the permeation of one or more gases selectable as a test gas.